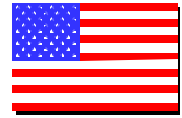




FreedomCAR



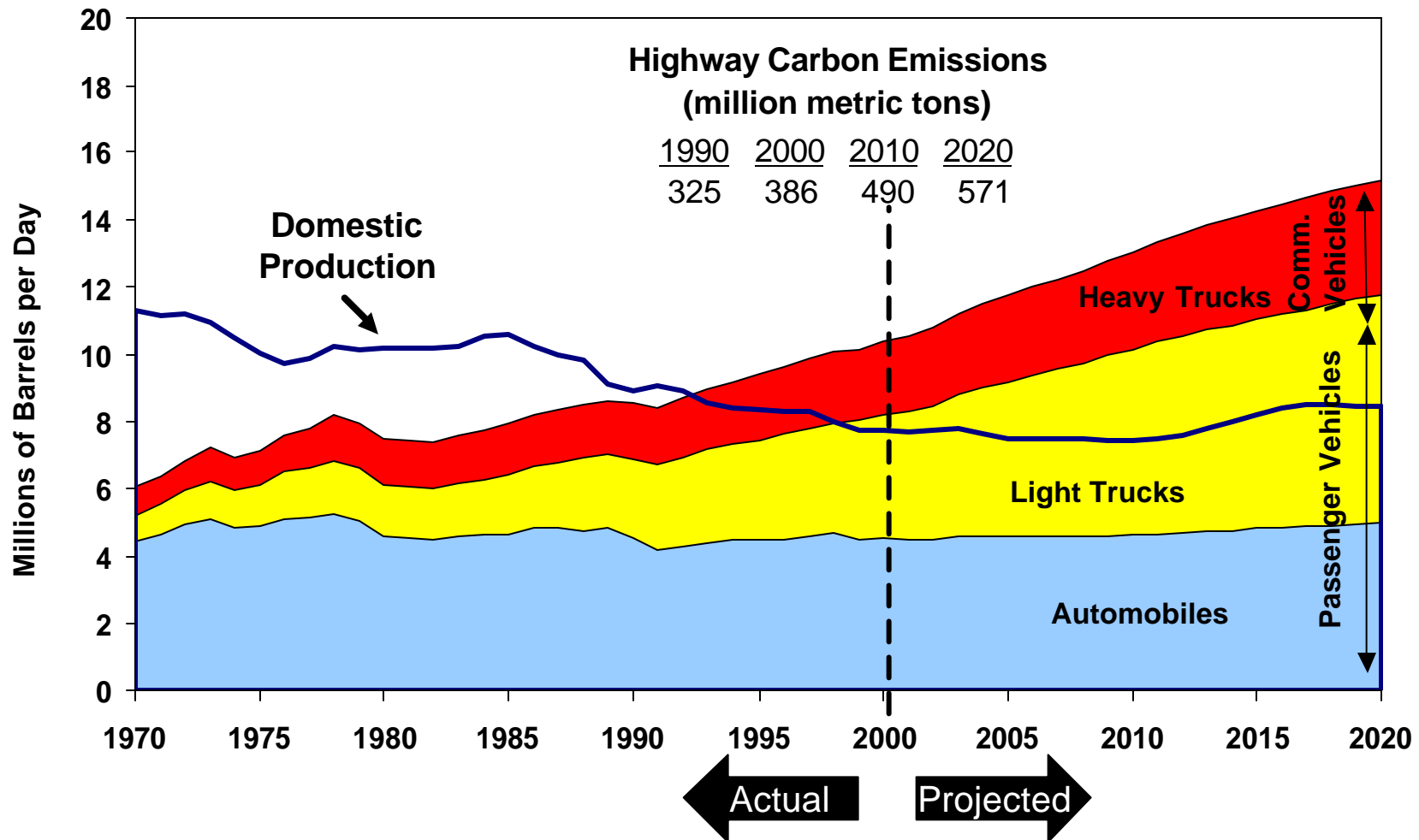
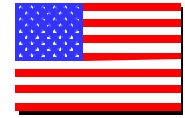
Energy Security For America's Transportation

**National Transportation Research Center Open House
Oak Ridge National Laboratory**

May 6, 2002



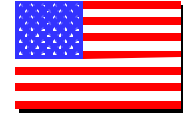
A Growing “Oil Gap”



Source: Transportation Energy Data Book: Edition 21, DOE/ORNL-6966, September 2001, and
EIA Annual Energy Outlook 2002, DOE/EIA-0383(2002), December 2001



Closing the Oil Gap



✓ **Increase the Supply of Oil**

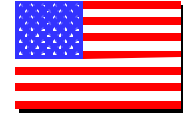
AND

✓ **Reduce the Demand for Oil**

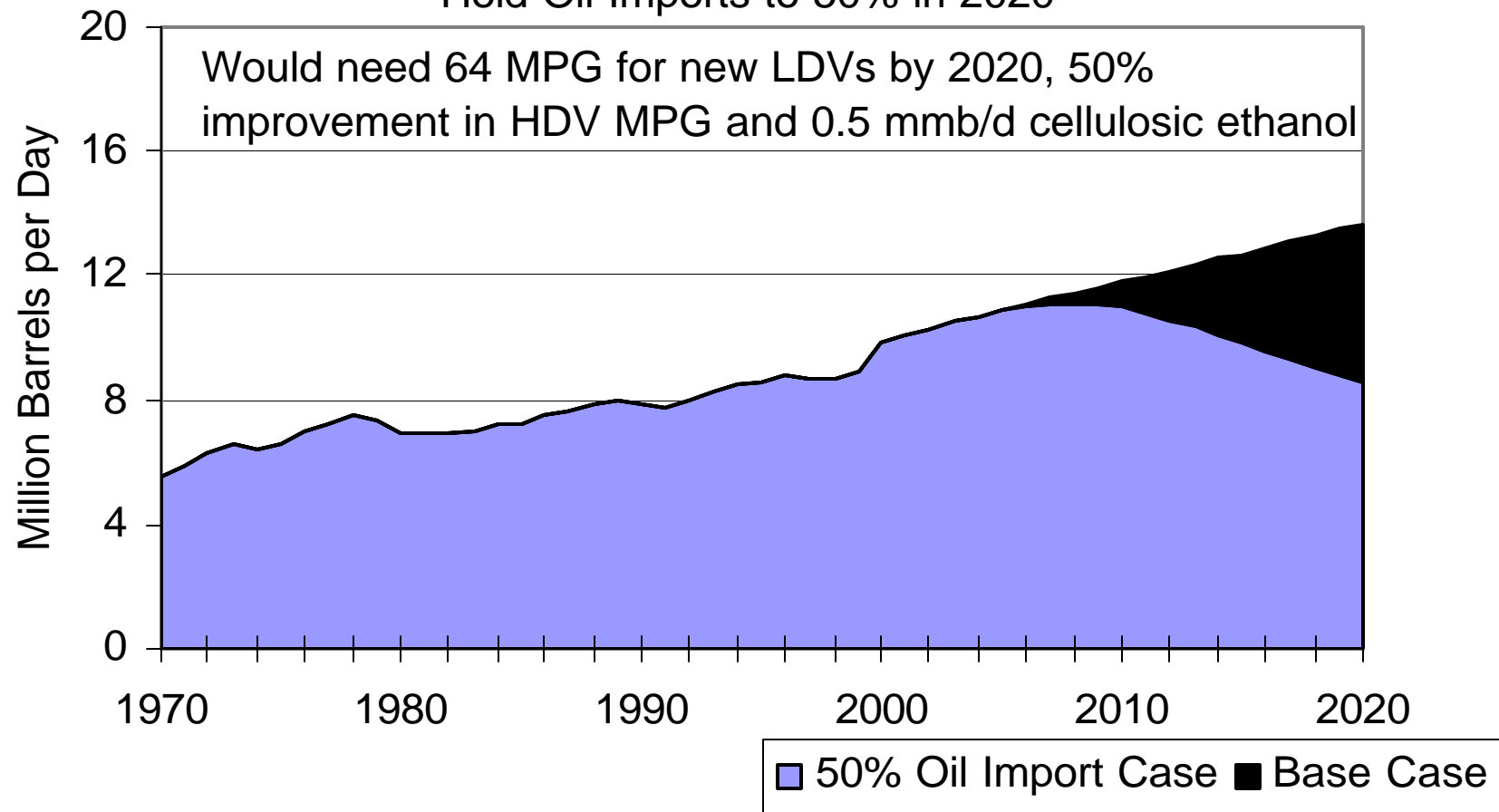
- Improve the Fuel Economy of Vehicles
(& other Oil Using Equipment)
- Replace Oil with Alternative Fuels
(& Feedstocks)
- Reduce Vehicle Miles Traveled



Energy Security – Reducing Petroleum Imports to 50%

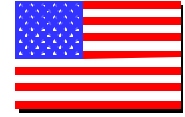


5 MMB/D Savings in Highway Vehicle Energy Use Would Help
Hold Oil Imports to 50% in 2020

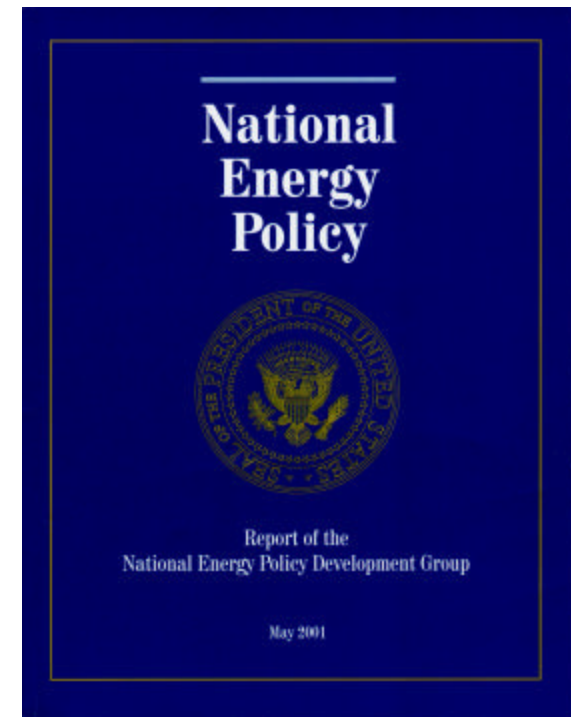




National Energy Policy

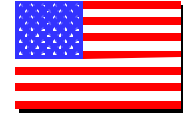


- “...that the President direct the Secretary of Energy to establish a national priority for improving energy efficiency.
(Recommendation 4.14)
- “Increase funding for renewable energy and energy efficiency research and development programs that are performance-based and cost-shared.”
(page xii)
- “...Based on this review, the Secretary of Energy is then directed to propose appropriate funding of those **research and development programs** that are performance-based and modeled as **public-private partnerships**.”
(Recommendations 4.2 and 6.3)





National Energy Policy



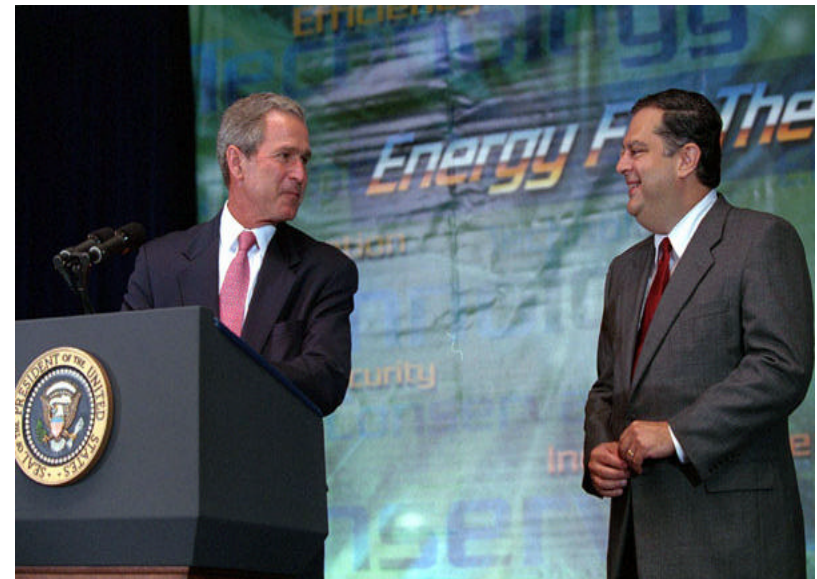
Directs the Secretary Of Energy to

“explore the possibility of a hydrogen economy...

“develop next generation technology including hydrogen...

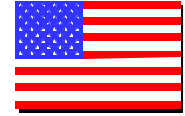
“Focus research and development efforts on integrating current programs regarding hydrogen, fuel cells, and distribution...

Develop legislation to provide for a temporary income tax credit available for the purchase of new hybrid or fuel cell vehicles.”





FreedomCAR



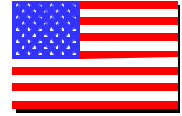
January 9, 2002

Secretary Abraham announces
the FreedomCAR Partnership

- The CAR in FreedomCAR is for
Cooperative **A**utomotive **R**esearch
- The Partners are:
 - U.S. Department of Energy
 - U.S. Council for Automotive Research(USCAR is a cooperative endeavor of DaimlerChrysler, Ford and General Motors to conduct pre-competitive research)



Energy Security Through FreedomCAR Technology

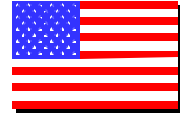


Transportation Freedoms

- **Freedom from dependence on foreign petroleum**
- **Freedom from pollutant emissions**
- **Freedom to choose the vehicle you want**
- **Freedom to drive where you want, when you want**
- **Freedom to obtain fuel affordably and conveniently**



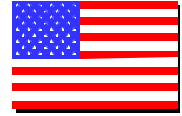
Strategic Approach



- Develop technologies to enable mass production of affordable hydrogen-powered fuel cell vehicles and assure the hydrogen infrastructure to support them.
- Continue support for hybrid propulsion, advanced materials, and other technologies that can dramatically reduce oil consumption and environmental impacts in the nearer term.
- Instead of single vehicle goals, develop technologies applicable across a wide range of passenger vehicles.



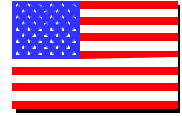
Goals



- Develop reliable systems for future fuel cell powertrains with costs and performance comparable to conventional internal combustion engine/automatic transmission systems
- Enable clean, energy-efficient vehicles operating on clean, hydrocarbon-based fuels powered by either internal combustion powertrains or fuel cells
- Enable reliable hybrid electric vehicles that are durable and affordable



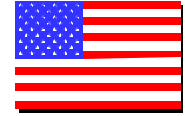
Goals



- Enable the transition to a hydrogen economy, ensure widespread availability of hydrogen fuels while retaining the functional characteristics of current vehicles
- Develop material manufacturing technologies for light weight, high volume production vehicles



2010 FreedomCAR Technology Specific Goals



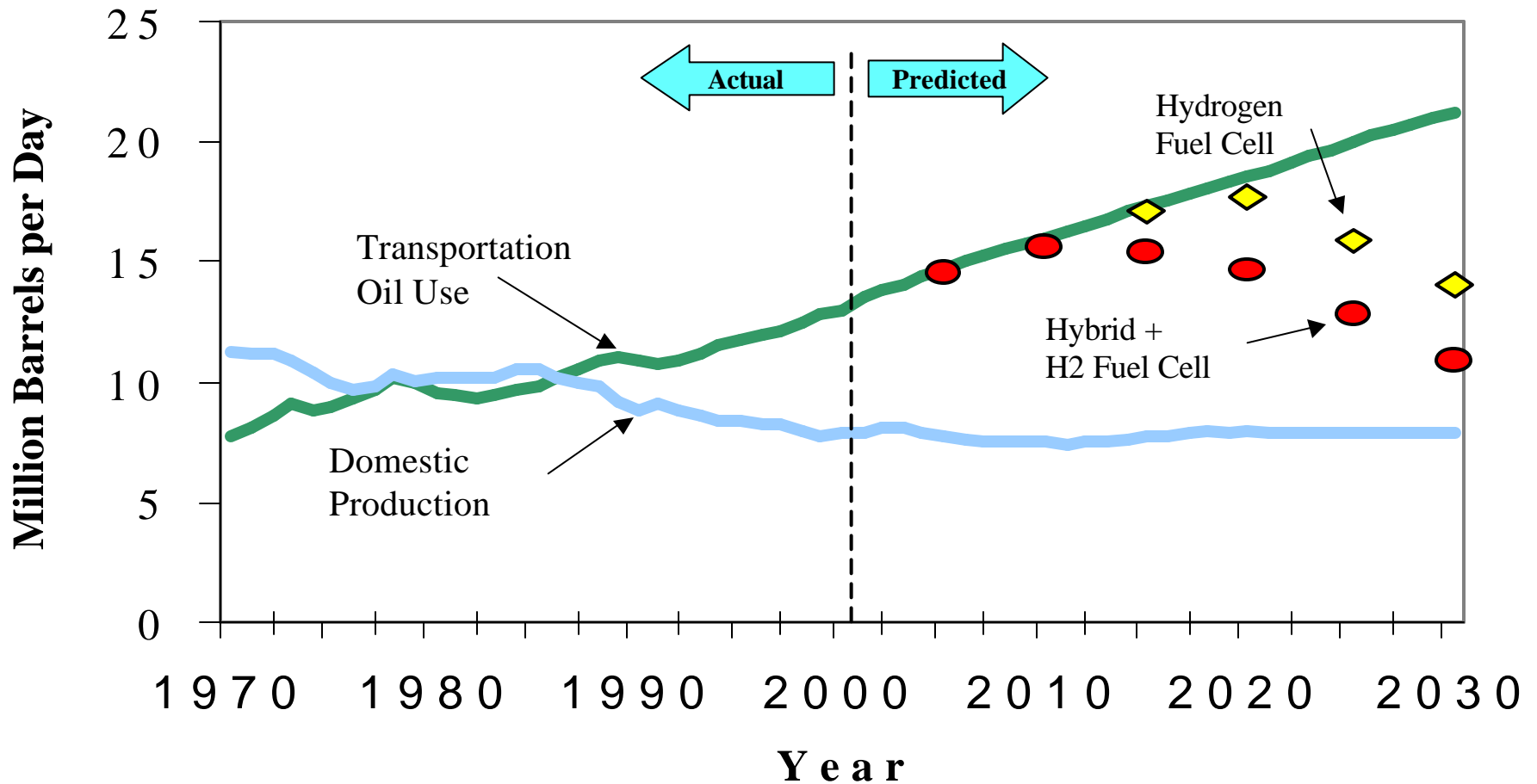
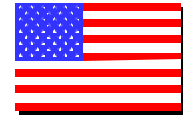
	Efficiency	Power	Energy	Cost**	Life	Weight
Fuel Cell System	60% (hydrogen) 45% (w/ reformer)	325 W/kg 220 W/L		\$45/kW (2010) \$30kW (2015)		
Hydrogen Fuel/ Storage/ Infrastructure	70% well to pump		2 kW-h/kg 1.1 kW-h/L	\$5/kW-h \$1.25/gal (gas equiv.)		
Electric Propulsion		≥55 kW 18 s 30 kW cont.		\$12/kW peak	15 years	
Electric Energy Storage		25 kW 18 s	300 W-h	\$20/kW	15 years	
Materials						50% less
Engine Powertrain System*	45% peak			\$30/kW	15 years	

* Meets or exceeds emissions standards.

** Cost references based on CY2001 dollar values.

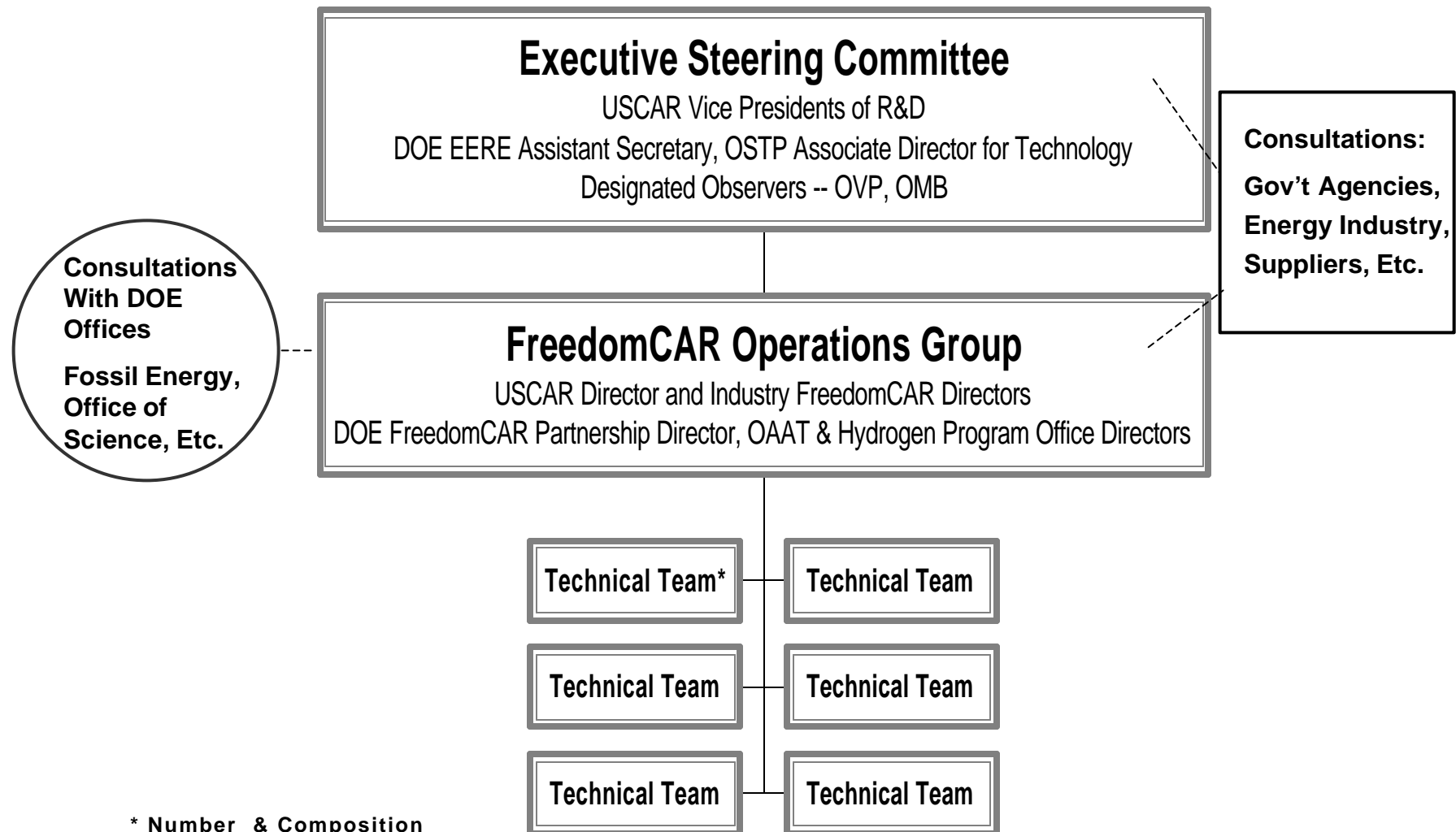
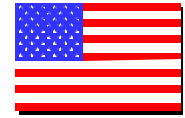


Closing the “Oil Gap”





FreedomCAR Organization

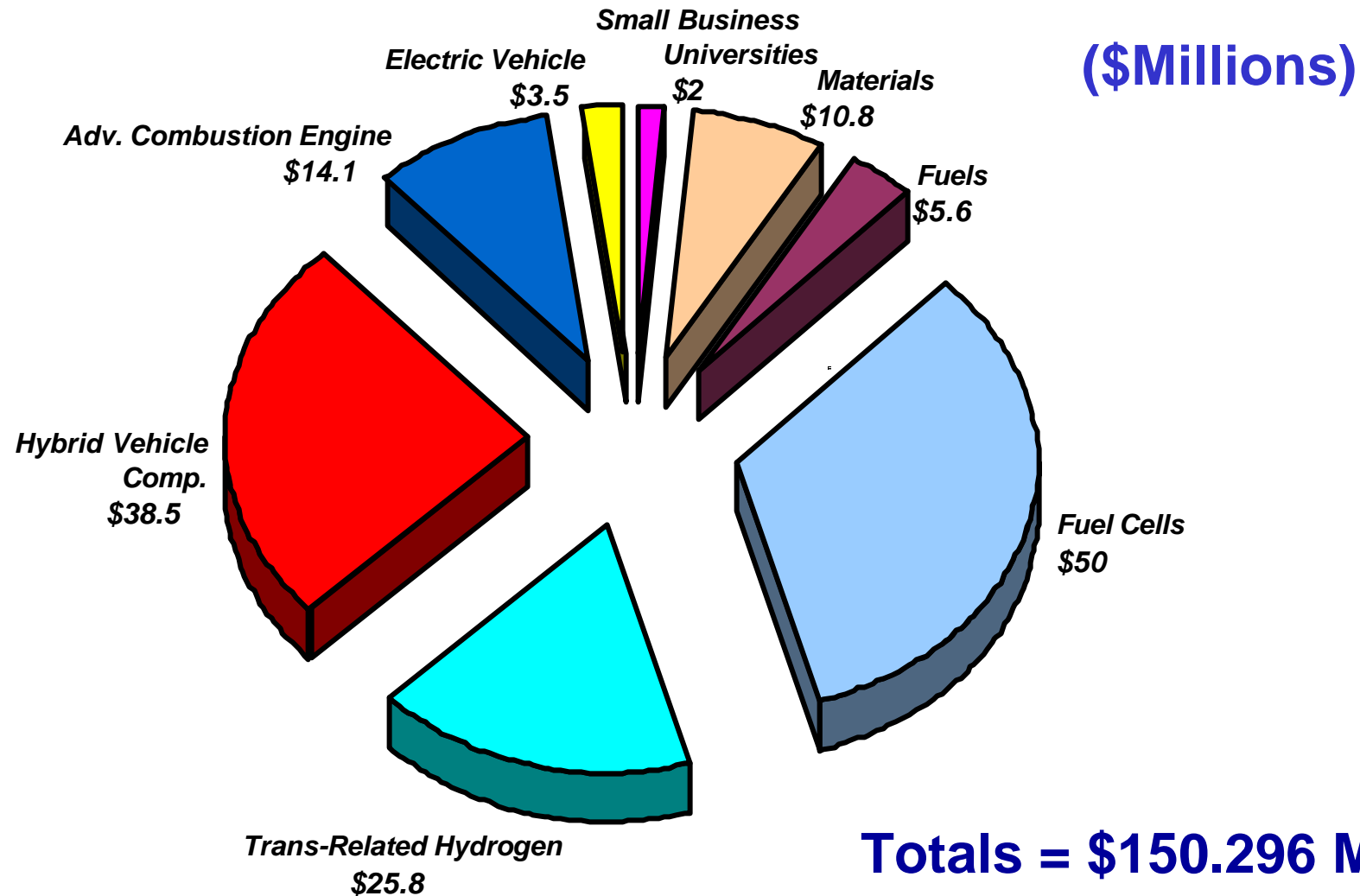
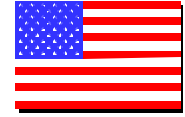


* Number & Composition
of Technical Teams TBD

February 5, 2002

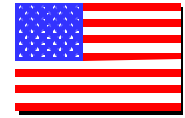


FreedomCAR FY03 Budget Request Reflects Fuel Cell and Hydrogen Priorities





Fuels, Engines, & Emissions Research Center

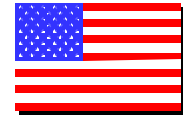


- Comprehensive laboratory for IC engine technology
- DOE National User Facility in the NTRC
- R&D from bench-scale to vehicle
 - Discerning fuel sulfur effects on emission controls
 - Better understanding of emission control catalysts
 - Emission control strategies developed at system level
- Resource for industry...five CRADAs, plus collaborations with catalyst companies





Power Electronics and Electric Machinery Research Center

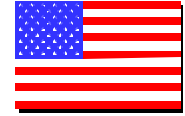


- **Resource for FreedomCAR**
- **DOE National User Facility in the NTRC**
- **Recognized world wide for expertise in**
 - **Advanced inverters and adjustable speed drives**
 - **Power transmission and distribution R&D**
 - **Electric machines**
 - **Power quality, efficiency, and power measurements**





The HTML is a DOE-Designated User Facility at Oak Ridge National Lab



Arvid Pasto, Director (865-574-5123)
Billie Russell, Administrative Assist.
Jesse Whittenbarger

Six HTML user centers focused
on materials characterization



www.ms.ornl.gov/htmlhome

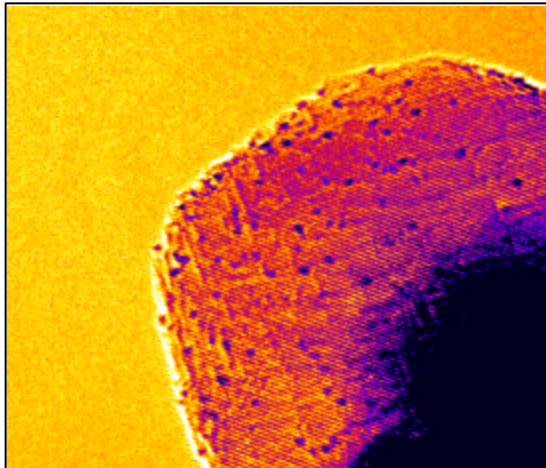
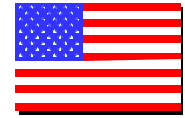
Materials Analysis
Thermophysical Properties
Diffraction

Residual Stress
Machining, Inspection, and Tribology Research
Mechanical Characterization and Analysis

The HTML Programs are funded by DOE's Office of Transportation Technologies
Dr. Sidney Diamond, DOE Program Manager



Materials Development Contribution to FreedomCAR



**Thermal management for fuel
cells and power electronics**



**Plasma/Microwave
processing for low-
cost carbon fiber**

**Casting
simulation for
optimization of
magnesium
components**

